Appendix 2
Nighttime Skywave Interference Protection

Univision Local Media Engineering – April 2016

I. Class B Service Improvements Resulting from Class A Skywave Contour Protection Deletion

1. Class A stations are presently protected from interference at night to their 0.5 mV/m skywave secondary service contours and, where such contours are not produced in some directions due to the use of directional antennas, the 0.5 mV/m groundwave contour. They also receive protection during critical hours to their 0.1 mV/m groundwave contours.[1]

2. These protections are the residue of an era long gone, dating to the 1939 rules and Standards of Good Engineering Practice. At that time, AM radio had not been fully developed and there were no FM, TV, or satellite-delivered aural services. Much of the rural parts of the country relied exclusively on the skywave services of then-Class I stations for news, information, and entertainment at night. Today, local AM, FM, and TV services are delivered to nearly all of the country, while satellite-based aural services cover the miniscule remaining "white areas".

3. Continued protection of the skywave secondary service contours of Class A stations prioritizes *distant secondary* service over *local primary* services. If the skywave contour protection of Class A stations were eliminated, many Class B stations in major markets, including many owned by the members of the AM Radio Preservation Alliance, could improve *local* service.[2]

4. To illustrate the potential opportunities for high-powered Class B stations to improve nighttime service in densely populated urbanized areas, the situations of Univision Radio's WRTO, Chicago, KTNQ, Los Angeles, and WAQI, Miami, were evaluated under an assumption that the skywave *secondary* service of Class A stations would not be protected during nighttime hours. With that protection deleted, it is estimated that *these three stations alone* can increase *primary, local* service to a combined population of 1.1 million people.

A. WRTO: 1200 kHz, 20 kW-D, 4.5 kW-N, DA-2, Chicago, IL

---

[1] The record in this proceeding has demonstrated conclusively that groundwave service is no longer realized at the 0.1 mV/m contour due to man-made noise. It is therefore recommended that the critical hours protection be afforded to the 0.5 mV/m groundwave contours of Class A stations, pending further consideration of the best means of protecting their *usable, primary, local* service during daytime and nighttime hours.

[2] It is presumed that the 0.5 mV/m groundwave service of Class A stations would continue to be protected from skywave interference, on a single limit basis, by Class B stations. The Commission's proposal to protect Class A stations from groundwave interference only and at the 0.1 mV/m contour (see footnote 1) is not supported, as it would not ensure the continued availability of *usable primary local service* from Class A stations..

5. WRTO utilizes a six-tower directional antenna array, with four towers used during the day and all six towers used at night. The combination of its night power and incoming interference limits its service during those hours. The station has multiple protection requirements to other Class B stations, but its primary limitation during nighttime hours is the protection of the skywave secondary service contour of WOAI, San Antonio, TX.

6. The WRTO nighttime directional antenna radiation pattern was modified to protect the 0.5 mV/m groundwave contour of WOAI but not that station's skywave secondary service area. This evaluation assumed use of the existing towers, but nighttime-only towers #5 and #6 were repositioned slightly to maximize the prospective service increase. With the WOAI skywave contour protection ignored, it appears possible for WRTO to operate at 6 kW at night.

7. Figure 1 illustrates the expansion of the WRTO 10.3 mV/m nighttime interference-free service contour that would result from the prospective 6 kW operation. Coverage is extended over the suburbs of Dixmoor and Robbins, as well as over the City of Chicago itself. The modified directional radiation pattern increases the population within the 10.3 mV/m nighttime interference-free contour by 278,882 people.

B. KTNQ: 1020 kHz, 50 kW DA-2, Los Angeles, CA

8. KTNQ, licensed to Los Angeles, operates on 1020 kHz with fulltime 50 kW power and a directional antenna array that produces different radiation patterns during daytime and nighttime hours. The station's most critical protections during nighttime hours are toward the skywave secondary service contour of KDKA, Pittsburgh, PA, and groundwave service contour of KCKN, Roswell, NM.

9. The nighttime directional antenna radiation pattern was modified to protect the 0.5 mV/m groundwave contour of KDKA but not that station's skywave secondary service area. Use of the existing four towers was assumed, with no evaluation done of the possibility of adding the fifth tower (presently used only during daytime hours) to the array. The unusual construction of the KTNQ site, with warehouses built around the towers and an elevated imaging screen above those warehouses and their parking lots, effectively precludes tower repositioning.

10. Figure 2 illustrates the coverage expansion that results from the modified directional radiation pattern. The population within the 7.3 mV/m nighttime interference-free contour increases by 465,947, extending service in the Pomona area and in Orange County. The latter improvement is essentially a "dividend" of the radiation relaxation toward KDKA that, by the mathematics of the directional antenna system, becomes possible.

C. WAQI: 710 kHz, 50 kW DA-2, Miami, FL

11. WAQI, licensed to Miami, operates on 710 kHz with fulltime 50 kW power and a directional antenna array that produces different radiation patterns during daytime and nighttime hours.

12. The station's licensed nighttime directional antenna pattern is unusual in that it was converted to a "standard pattern" 35 years ago using a reduced "Q factor" and fitted pattern augmentations toward the skywave secondary service contour of WOR, New York. The normal "Q factor", specified by §73.150(b)(1) of the rules, cannot be applied without causing presumed interference to the WOR protected skywave secondary contour. Because the station's licensed nighttime radiation pattern preceded the adoption of the standard pattern concept and its component "Q factor", this atypical pattern description and authorization is "grandfathered".

13. WAQI is presently in the process of relocating to a new transmitter site. At any such location, its nighttime directional antenna radiation pattern must use the "Q factor" specified by §73.150(b)(1) to define its standard radiation pattern. To comply with the present rules, WAQI is limited to 15 kW during nighttime hours, a 70% reduction in operating power.

14. If protection of the WOR skywave secondary service contour were eliminated, WAQI could retain its 50 kW nighttime power at its new transmitter site. With related directional pattern changes, the station's 8.6 mV/m service population would exceed that of the 15 kW facility, compliant with the present rules, by 372,800 people at the 25 mV/m contour and 400,488 people at the 8.6 mV/m contour. Figure 3 illustrates the compliant and prospective coverage contours.

15. It is notable that Cuba operates two high-powered stations on 710 kHz, not recognized by the ITU Region II Plan, which have caused considerable interference to all United States stations on that frequency for the past 30 years. The night interference limits of these Cuban stations along the WOR protected contours, both the skywave secondary service and the groundwave primary service, far exceed the limits that WAQI would impose with its prospective 50 kW nighttime operation. In essence, WOR has had no meaningful skywave service southward for 30 years, yet the rules require its continued protection.

16. The contour maps of Figures 3 and 4 present both the 25 mV/m and 8.6 mV/m contours. Service to the 8.6 mV/m contour is not realized due to the substantial incoming Cuban interference. It is believed that the 25 mV/m contour better approximates the boundary of usable service, based on measurements of the incoming Cuban groundwave signals.

17. As previously noted, strict application of §73.150(b)(1) to WAQI at its new transmitter site will force a reduction in its authorized nighttime operating power from 50 kW to 15 kW. Figure 4 illustrates the impact of this reduction. The 25 mV/m service population would be reduced by 282,923 people and the 8.6 mV/m service population would drop by 172,384 people.

II. RSS Interference Calculations

18. The Commission has proposed to return the "exclusion factor" to its pre-1991 value of 50% and eliminate the inclusion of adjacent-channel interference in the calculation of the nighttime interference-free contour value, essentially restoring pre-1991 standards for nighttime

interference evaluation. Commenters in this proceeding attempted to tie the imposition of 25% exclusion to the rescinded "ratchet rule".

19. This writer attended most of the meetings between industry representatives and FCC staff during the consideration of the rule changes made in 1991. No link between 25% exclusion and the "ratchet rule" is recalled. The 25% exclusion factor was intended to limit additional interference, while the "ratchet rule" was a misguided attempt to reduce interference by penalizing the oldest stations which suffered the least interference and provided the greatest service. Nor was the 25% exclusion factor tied to the inclusion of adjacent channel signals in the RSS calculation. That factor, the "ratchet rule", and inclusion of adjacent channel interference were considered independently of each other.

20. The function of the 25% exclusion principle is to limit RSS interference increases, caused by new or modified station operations, to ¼ dB. The prior 50% method limited such increases to 1 dB. The proposed restoration of 50% unnecessarily reduces interference protection. This is of particular concern at several Univision AM stations, which operate with high night powers and/or serve densely populated urban areas, as any increase in nighttime interference could degrade the consumer experience.

21. The inclusion of weighted adjacent channel interference in the nighttime RSS calculation has significant deficiencies. However, adjacent channel interference has long been a problem at night and has contributed significantly to the reduction of receiver bandwidth by the consumer electronics industry. Rather than simply eliminating adjacent channel consideration and returning to the pre-1991 situation without explanation, the Commission should specifically address the adjacent channel protection question and its technical parameters in a FNPRM. Some degree of adjacent channel protection is necessary to maintain and improve the consumer experience

17 April 2016

Karl D. Lahm, P.E.
Director, RF Systems Engineering
Univision Management Company
klahm@univision.net
847.245.8699